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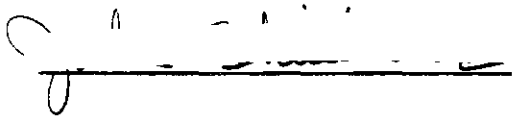

NONENGINEERING FACTORS IN URBAN AREA EXPRESSWAY LOCATION DETERMINATIONS

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NONENGINEERING FACTORS IN

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DETERMINATIONS

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SUMMARY

Expressways have significant impacts upon local urban areas. This has been the source of conflict and controversy. Improved acceptance of expressways requires that such impacts be recognized and considered during all stages of location determinations.

The objective of this study is to present procedures for evaluating and selecting between feasible alternate alignment proposals from the point of view of impact upon local urban areas. These procedures should be usable by planners or non-planners and should be understandable to citizens and to public officials of all levels of government.

The recommended approach is based on concepts common to land use planning. The local system of streets and land areas is the basis of investigation and evaluation. Two groups of factors are discussed. The first is the displacement effects of the proposed rights-of-way. The second is the difference in effects of alternate alignments upon adjacent areas.

Displacement effects that should be evaluated include families that may present relocation problems due to racial or low income characteristics, public facilities such as schools, and private properties which provide public income. Some other displacement effects that may also be evaluated are summarized.

Effects of expressways on adjacent areas that should be evaluated include impact on abutting property of changes in traffic on local streets, the division of school and commercial service areas, the creation of land parcel remnants along rights-of-way, and the change in use potential of

unsubdivided, undeveloped and urban renewal areas. Other possible approaches to analysis are also mentioned.

Illustrative forms for use in conjunction with analyzing, tabulating and evaluating the effects of the alternate alignments are included in the Appendix. The use of these forms, the maps required, and the most readily usable sources of information are discussed.

The final chapter discusses a method for evaluating the combined effects and the selection of the most desirable alignment including consideration of cost factors.

CHAPTER I

INTRODUCTION

Study of examples of expressway location controversies shows that the point of debate is usually the anticipated impact of the expressway upon urban development. There is a need, then, for ways to evaluate expressway location proposals from the point of view of obtaining optimum relationship to such development. In practice, this must be limited to evaluation of alternate alignments which are feasible to construct and which meet minimum geometric standards. Given the general location and function of an expressway, the determination of feasible alternate alignments is an engineering problem, but the evaluation of those alternatives on behalf of the local urban area should be a planning endeavor.

The 1956 Highway Act, as amended, requires consideration of local economic impact of expressway locations, and requires local public hearings on alignment proposals prior to final approval by the Bureau of Public Roads (1). California State law requires a consideration of community values by the State Highway Commission in the selection of freeway locations (2).

In California there have been a number of publicized conflicts over expressway location proposals. These illustrate some of the potential differences between local interests and state and national interests in development of expressway systems, particularly within urban areas.

In San Francisco, various elements of the expressway system have been attacked as conflicting with features of great local value. These include proposals to route expressways through the Golden Gate Park and adjacent to the Ferry Building (3).

Controversy over the Junipero Serra Freeway connecting San Francisco with San Jose was due to disagreements between 29 local communities along the route as to the exact alignment. Each wanted the facility nearby, but actually within a neighboring town (4).

In Los Angeles, the location of the Golden State Freeway through Griffith Park caused controversy and delay. The Board of Commissioners of the Los Angeles City Recreation and Park Department was the principal objector (5).

Each of the ten alternate routes proposed by the State of California for the location of the Grove-Shafter Freeway in northern Oakland had opposition. Eventually a compromise route was adopted which avoided a local business district at an additional cost of almost 2 million dollars (6).

In Contra Costa County, conflict over the location of the Shepherd Canyon Freeway centered around the provisions of an addition to the State law requiring consideration of "community values" in the selection of freeway locations. Difficulties arose over the specific identification of such "values." Some of the locational criteria that the Highway Commission decided the selected route met were that it:

1. minimized damage to the natural topography;
2. did not create an abundance of odd shaped usable parcels;
3. encouraged the most advantageous use of land; and
4. did not cut the community off from its center (7).

In Montgomery, Alabama, the alignment of Interstate Highway 85 proposed by the State Highway Department would bisect a Negro residential area. The resulting controversy included charges by State officials, of interference for political purposes by federal officials. The controversy will apparently delay the construction of that portion of the Interstate System (8).

State highway agencies usually conduct expressway route location hearings -- sometimes without local official support or without prior local study of the alignments proposed. This is unsatisfactory. The planning and location of expressways should be a team effort and a joint responsibility of state and local officials.

Nonengineering factors of local urban area importance should be kept in mind throughout the expressway location process. However, the main problem is convincing the highway engineers who have responsibility for locating expressways that such factors are valid and can be evaluated for any alignment proposal. This thesis presents a method of conducting a systematic documented nonengineering study of alternate alignments that can be made early in the location process. Such a method appears to have a good chance of acceptance by highway engineers at this time.

The study presents procedures which can be used to identify, tabulate and evaluate the more important nonengineering factors that should be considered in choosing between alternate expressway alignments in urban areas. The factors proposed for use are either individually quantifiable for any alignment or relatively comparable between alternate alignments. The suggested investigative procedure should be readily usable by both planners and non-planners.

The terms "expressway" and "freeway" are used interchangeably and the locational factors discussed are applicable to either. The term "expressway" is used except where reference is made to examples or sources of information using the term "freeway."

"Urban area" refers to an incorporated urban community and the surrounding area which is urbanized, is in the process of being urbanized, or is potentially developable as a part of the urban area.

The author first searched the available literature for nonengineering factors that have influenced expressway locations and that have proven to be of importance in the evaluation of expressway impacts. From these were selected those factors which could be used to evaluate preliminary alignment proposals. These were then narrowed down to those which are of urban area importance and which can be tabulated and quantified or rated.

There are many highway, freeway, or expressway impact studies. However, very few of them are useful for determinations to be made in advance of construction. Even fewer of them contribute to the evaluation of proposed alignments from the point of view of a local urban area. Much effort apparently has been expended on elaborate studies "proving" that expressways are universally beneficial, regardless of location.

It is assumed that two prior steps in the evolution of an urban area expressway have been taken. The first and most important step is the mapping of the alternate alignments that meet engineering and geometric standards for construction and traffic. The results should be preliminary center lines, generalized rights-of-way and interchange locations for each alignment.

A comparative study of nonengineering factors for the alternatives should be the next step. A recommended technique for such a study is presented in two groups of factors.

The first group of factors, discussed in the next chapter, includes the displacement of families and land uses by the rights-of-way. The second group, presented in the third chapter, includes the differences in effects of expressways on areas outside the rights-of-way. This second group includes the impacts on abutting land uses of changes in traffic on local streets; isolation of parts of school service areas and commercial trade areas; the creation of unusable remnants of property contiguous to the rights-of-way; and the change in use suitability of unsubdivided, undeveloped and urban renewal areas. The final chapter discusses the combination and evaluation of all these factors as a basis for the local selection of the most advantageous alignment.

Included in the Appendix are illustrative forms for tabulating the effects of each alignment, and an illustrative evaluation form for the comparison of the effects of the alternate alignments.

CHAPTER II

DISPLACEMENT EFFECTS OF EXPRESSWAY RIGHTS-OF-WAY

Displacement of families and land uses by right-of-way clearance is the impact of an expressway that is first recognized by the local urban area. Adjustments immediately begin to take place. These may be either advantageous or costly to individual families, businesses and institutions, or to the public in general. These effects, or the ramifications of them, can be determined by an advance study of alignment proposals.

The objectives of a local evaluation of the displacement effects of alternate expressway alignments should be to determine which alignment will cause the least disruption, or will offer the greatest opportunities for eliminating problems and improving urban development. The displacement effects suggested for tabulation are quantifiable, or can be estimated, for any alignment. These effects are expressed in dollars, or numbers of families or of activities.

Those displacement effects that are most important to the local urban area are the ones that should be tabulated. The procedure should be to systematically analyze the area within the right-of-way of each proposed alignment for certain preselected factors. These factors should indicate degree of impact, characteristics of displaced families or activities, and costs to the locality of displacement. Any advantages that the locality may realize because of displacement should also be tabulated.

A set of tabulation forms should be prepared with spaces for listing the displacement effects upon each parcel of property within each right-of-way. This information must be summarized for each alignment for entry on the evaluation form.

There are certain steps which will have to be taken regardless of specific displacement effects to be tabulated. First, it will be necessary either to obtain from the highway engineers the proposed right-of-way lines of each alignment, or to estimate the right-of-way lines from center line information.

Next, the right-of-way of each proposed alignment should be plotted on a base map showing each parcel of property touched by the right-of-way. One base map or a separate base map for each alignment can be used. These maps should be at a scale no smaller than 1" = 500'. Such maps are usually available from the local tax assessor or city or county engineer.

Lots and blocks along each alignment should be identified by a numbering system for tabulation purposes. A different block number is suggested for each group of lots between points where the right-of-way is crossed by existing streets. For short route distances, it may not be necessary to use a block numbering system in addition to the lot numbers.

Most of the information will have to be tabulated in the field. However, information in local offices, such as the records of the tax assessor and existing land use surveys the office of the planning agency, should be used whenever possible in order to reduce the field work. The information collected should be placed directly on the tabulation forms

rather than upon the alignment maps, because of the large amount of information required. The illustrative tabulation form in the Appendix has been designed for that procedure.

In some instances the state highway agency will have collected data on the characteristics of property required for right-of-way purposes, particularly as it relates to cost of right-of-way acquisition. This may exist in punched card form. This information should, of course, be used. In fact, the information that the state highway agency has available should be a point of beginning for anyone evaluating alternate alignment proposals.

Three of the potentially most important displacement effects are next discussed in detail. These are (1) displacement of families that may present relocation problems; (2) displacement of public facilities; and (3) elimination of public revenue producing properties. The issues that are involved in each are explained and the most readily useable sources of information are identified. Finally, there is a brief listing of other displacement effects which may be of importance to a locality.

Displacement of Families

Difficult to Relocate

Displacement of families by public action is a potential source of local controversy and expense. A significant displacement problem, combined with limited relocation possibilities at the time displacement will actually occur, should be recognized when evaluating alternate expressway alignment proposals.

The family characteristics which should be tabulated are those indicating potential relocation problems. In most localities those

problems will be indicated by minority racial characteristics and low family income. Tenure (rental versus ownership) may be an important factor in some localities. If so, racial and income characteristics should be tabulated according to tenure. The City Directory is the most readily usable source of information indicating whether one of the residents at a street address is the owner. Most dwellings housing more than one family are used, at least in part, for rental purposes and are readily identified by a field survey.

When large-scale displacement of families that are limited in place of relocation residence because of race or low income occurs, relocation can be very difficult. There are different opinions on the validity of considering such factors in the evaluation of expressway alignments. However, the displacement of families and attendent relocation problems are important and should be recognized when comparatively evaluating alternate alignments from the local point of view.

The data needed for the local evaluation of alternate alignments should be obtained from sources other than individual interviews if at all possible. For one thing, the disturbance of the local population in general, and the potential displacees in particular, should be avoided. Also, individual interviewing, even on a sampling basis, is expensive and time consuming. Furthermore, the results may not be more dependable or more accurate for preliminary survey purposes than are estimates.

The tabulation form in the Appendix has spaces for listing the racial characteristics of occupants and the present rental value of each dwelling unit to be removed. The evaluation form shows this information translated into relocation requirements. These requirements should be

evaluated in terms of local housing policies, programs, and problems.

Restricted Minority Families

The displacement of restricted minority families, primarily Negroes, may create problems important to a local urban area, but which are minor to higher levels of government. Available housing may be used for relocation if suitably located, and is in adequate condition and available at a fair price. However, if existing housing for Negroes is inadequate, then a real problem arises. In many localities, Negro expansion creates a conflict between present white owners and Negroes if the expansion involves conversion of existing white residential areas. If new areas of occupancy are needed, there may be limitations in location and financing.

Negro occupancy of any parcel of property can usually be readily identified by field observation. Most local residents are familiar with general areas of Negro occupancy. Census information and various local public records will also indicate areas in which there are Negro residents.

There are many different patterns of racial segregation in housing that may be encountered. In some localities, there may be a few large areas of complete Negro occupancy. In such cases, race of occupants for most properties may be readily determined from local office or Census data. In other localities, where the pattern may be one of many small areas of completely segregated Negro occupancy, field surveys may be essential. Localities containing areas that are in transition from white to Negro occupancy will cause tabulation difficulties. The question that will have to be answered locally in that case is whether to tabulate

the racial characteristics of occupants as it exists at the time of the survey or as it is expected to exist at the time right-of-way clearance will actually take place.

Low Income Families

Low income is the most universally applicable family characteristic indicating limitations in place of residence. Also, low income is frequently associated with substandard housing. Regardless of tenure, race, or place or condition of residence, displaced families with low income will be limited in choice of relocation housing.

Displaced families may voluntarily relocate outside the locality, or in local substandard housing, or in any other available private housing for which agreements can be made for purchase or rent. Advance studies can only estimate in broad categories the relocation requirements that would probably result from expressway construction.

Family income is considered as being low when it is below the level at which the family can purchase standard housing in the open market. The minimum market price of new single family housing should be determined for each locality from interviews with realtors and home builders. This will usually be from $10,000 to $12,000, but in some localities it may be higher. Using a ratio of maximum price of home owned to family income of 2-1/2 to 1, as usually required by lending institutions, this means that the minimum annual family income required for purchasing new housing in most localities is from $4,000 to $4,800. Families with lower incomes must live in used or rental housing.

Relocation housing built under the provisions of Section 221 of the National Housing Act can usually be purchased at a slightly lower

price than most conventional housing. This housing is first made available to families displaced by government action. However, most "221 housing" is built to sell near the maximum allowable price for such housing in each locality. That price is now $11,000 in most communities, although in localities having high costs of living it may be as high as $15,000 (9).

Public housing may be the only answer for satisfactorily housing some of the low income families. However, there are limits upon both minimum and maximum income for admission to public housing. This varies slightly with family composition and for individual housing projects. The maximum income limit is seldom as high as $3,800 per year, even for a large family. The minimum assured income required is usually at least $1,200 per year, for a minimum rental payment of at least $20 per month. There are also limitations in the number of families that can be admitted to any public housing project at the lowest income level. This is necessary in order to maintain the average rental income plus federal subsidy for each project at the level required to keep the project solvent.

There is a gap between the upper limit on family income for admission to public housing and the minimum income with which new housing can be purchased. Presently, not even "221 housing" closes that gap. For preliminary alignment evaluation purposes, this gap can usually be ignored. However, in some localities it may be significant.

There may be some displaced families with incomes less than the minimum required for admission to public housing projects. Although many of these families will be able to obtain welfare assistance in order to meet admission requirements, such assistance is not always available.

Also, local public policy may not support additional public housing. In that case, all families not classified as self-sufficient would present serious relocation difficulties.

Family income is very difficult to obtain accurately, even from personal interviews. For purposes of evaluating preliminary alignment proposals, present housing value should be a satisfactory substitute for specific income data as an indication of family income. Regardless of method used, the same method should be used for evaluating each alignment. In that way, the results will be comparable.

The tabulation form has spaces for noting the estimated rent classification of each dwelling unit to be removed. This is in terms of present rent or the rental equivalent of value of dwelling owned or occupied. The evaluation form is designed to translate that information into the probable number of displaced families that would be self-sufficient (including eligibility for 221 housing), would be eligible for public housing, or would have an annual income insufficient for any of these types of housing.

The first step in the establishment of rent classifications which will identify relocation requirements is to contact representatives of the local housing authority. They will be able to specify the rental range for admission to public housing based upon family size and racial characteristics.

Rent or equivalent rental value above the maximum limit for eligibility for public housing should be classified as indicating a self-sufficient income level. Rent below the public housing range should be classified as indicating minimum income.

The next step should be to determine the rental classification of the average residential property within each block along each alignment. After this has been done, a field inspection should be made in order to verify that classification and to identify and classify obvious variations from the block average. The judgment of the field inspector should be adequate to classify the variations because of the broad categories used.

The best source of information on rent paid or value of property owned within each block is likely to be the local realtors. They may be able to give specific information for some properties, in addition to averages for the blocks.

The best alternate source of information is the block data on housing published as part of the 1960 Census of Housing and Population. The average contract rent is listed for each block. The average value of dwellings owned by occupants may also be determined from block data. However, this information is available only for incorporated municipalities of over 50,000 population.

If the above procedures are not usable, the assessed value of individual parcels of residential property may be translated into market value by a locally applicable ratio, and then grouped by rental classifications. As a last resort, when none of the above procedures is workable, field estimates of the rental classifications of all properties may be made.

Displacement of Public Facilities

Public facilities that may be displaced include schools, libraries, fire stations, parks, water and sewage treatment plants, and other physical

facilities and property in public ownership and usage. Displacement of public facilities and occupancy of public property should be avoided in most cases. Occasionally an existing facility may have outlived its usefulness or may be in the wrong place and should be replaced. In those cases, displacement by an expressway may offer a corrective opportunity.

The issues involved in the displacement of public facilities are general disruption of community organization, as indicated by numbers of facilities displaced, and the value of the displaced facilities. The locations of some facilities such as schools and sewage treatment plants, are relatively more important to the locality than the location of other facilities. These facilities may be particularly difficult to reestablish in a suitable location. The value of the property taken for the right-of-way may have no relation to the cost of replacing the facility in a suitable place.

Only a portion of some property will be occupied by an expressway right-of-way. A determination should be made as to whether or not relocation would be required in order to continue operation. Minor adjustments in alignments may eliminate a problem.

In cases in which the relocation of a facility is required, an estimate should be made of the cost of reestablishment. Part or all of that cost should be assigned to the pertinent expressway alignment. The assignment should be realistic, and should take into account the possible benefits of replacing depreciated facilities with new facilities more closely related to service areas. Some public property, such as parks, open space and golf courses, may never depreciate in value and, in fact may increase in value to the public as a stabilizing influence

as the surrounding area ages and tends to deteriorate. Public monuments or historical sites may be priceless. The displacement of such facilities should be noted as something to be avoided if at all possible.

Estimates of the displacement effects upon public facilities in terms of interruption of service and construction of replacement facilities, and amount and timing of expenditures, should be carefully checked with the agency responsible for each facility. Also, the schedule of construction of replacement facilities should be compared with local public improvements programs and capital expenditures budgets.

The most obvious sources of information about public facilities are the public agencies or departments having jurisdiction. These should always be interviewed first in any study of possible displacement effects. Normally they will be able to accurately evaluate the cost of replacing facilities. However, the person making the study of alignment proposals may occasionally be required to use his own initiative and judgment. If so, the endorsement of the responsible agency should be sought. As illustrated in the San Francisco expressway program, differences of opinion between local officials can be one cause of controversy (10).

Decrease in Public Revenue

Any expressway alignment in an urban area will displace tax producing property and occupy taxable land. Other public revenue may also be lost. When comparing alternate alignments these effects should be tabulated regardless of estimates of eventual increases in surrounding property values. The figures on immediate loss of public revenue may be particularly useful for publicity purposes.

Displacement of taxable property is frequently minimized as a factor in assessing the net value of an expressway to a locality, because of contentions that the effects of an expressway upon land values in the vicinity will far outweigh any losses. However, any such benefits will not accrue immediately. In the meantime each municipality may lose a substantial amount of taxable land within its boundaries. The effects of alternate alignments upon public revenues, for comparative evaluation purposes, should certainly be determined and evaluated.

An expressway alignment may occupy land that is presently vacant but is actually ready or overdue for development, as indicated by the availability of utilities, and the presence of nearby development. This should be taken into account in tabulations of the value of vacant property.

The local tax assessor should be the primary source of information on property taxes produced by each parcel of property. This information is readily translated into annual tax loss to the municipality.

In some localities, annual business licenses and other means of obtaining public revenues, may be significant. If so, these should be included in the tabulation of public income that would be lost because of the displacement effects of each alignment. The financial officer of the municipality or the county will usually be the primary source of this information. His records may be indexed in a number of ways -- name of owner or street address -- so that the tabulation of property parcels should be properly indexed for that purpose in advance.

Other Effects of Possible Importance

The three displacement effects that were discussed in detail are

those that could be most important to local governing bodies. The tabulation form and the evaluation form in the Appendix list other displacement effects.

Space is provided for tabulating eliminations of zoning non-conforming uses and substandard housing units.

The impact upon businesses and industries is shown in terms of numbers of such activities displaced and the number of employees or amount of annual sales of each. The ultimate disposition of these activities could be very important to the locality -- some may relocate within the same taxing jurisdiction; some may relocate outside it; others may cease to exist.

The evaluation of impact upon institutions should be made in a manner similar to that of the impact upon public facilities. The actual cost of reestablishment is a vital factor and should be calculated and tabulated in a similar manner. Like public facilities, institutions may have unique relocation requirements.

The procedures explained previously should serve as examples of ways to identify, tabulate and evaluate all the displacement effects considered to be important to the local urban area, for any number of alternate expressway alignment proposals.

CHAPTER III

EFFECTS OF EXPRESSWAYS ON ADJACENT AREAS

After right-of-way clearance and construction are underway, the influence of an expressway on the continued utility, serviceability and development potential of adjacent areas begins. This is a permanent influence resulting from the location and physical characteristics of the expressway. Therefore, it needs to be taken into account before location decisions are made.

Selection of the most desirable expressway alignment from the point of view of impact upon adjacent urban areas is a matter for official local concern. The studies outlined below illustrate some procedures that can provide a factual basis for the selection.

This chapter will consider alternate alignments both within areas already developed and within areas subject to future urban development. The discussion of locations within developed areas includes the effects of changes in traffic on local streets, the bisection of school and commercial service areas, and the creation of property remnants along rights-of-way. For locations within areas subject to development, the effect discussed is the increase or decrease in development potential of adjacent areas according to use suitability. There are other effects that could be considered, but those mentioned above are important and illustrate the recommended investigative procedures. These or other effects that will have local importance should be studied in any specific situation.

Individual study areas must be delineated for each effect that is to be evaluated. The study outlined in this chapter is, therefore, more complicated than the analysis of displacement effects outlined in the previous chapter, in which the study areas are automatically defined by the right-of-way lines.

Considerations in the Delineation of All Study Areas

As a preliminary step, the alternate alignments proposed by the highway engineers should be plotted on a street base map of the locality. Locations of interchanges and local traffic cross-overs should be included. The map scale can be relatively small, but should be not less than 1" = 1/2 mile. Study areas can be located on these maps, and then larger maps showing individual property parcels can be used when needed to delineate precisely and to analyze the study areas in detail.

There are a number of general considerations applicable to the delineation of all study areas. First, areas in which the effects will be negligible or impossible to evaluate objectively should be ignored. Secondly, study areas should be contiguous to alignments; only in unique and obvious situations should noncontiguous areas be analyzed. Thirdly, similar standards should be applied to all alignments in the selection and delineation of study areas for identical effects.

The local system of streets and their abutting land parcels constitute the framework for the analysis of effects of alternate alignments. The results of the analysis of each study area should be tabulated in terms of physical characteristics of land utilization and occupancy. These characteristics include numbers of families, public facilities, businesses,

and land parcels; value of improvements and amount of annual business sales in dollars; and acres of land use in each of the study areas.

A set of forms for tabulating the pertinent features of the study areas for each alignment should be prepared after the effects to be studied have been selected. Illustrative tabulation forms based on the effects discussed in this chapter are included in the Appendix.

Most of the necessary information will be obtainable from local public agencies. The local planning office will be a primary source of information, particularly if it has a land use planning program. Without such a program, extensive field surveys will probably be necessary. The local city or county engineer will also be a source of information and assistance.

Effects on Developed Areas

The existing development in an urban area represents a large investment of private and public resources. It is a result of many interacting factors. One of the most influential factors is the transportation network.

This section presents methods for identifying some of the probable impacts on existing development of proposed alternate alignments. From this standpoint, the most desirable alignment will usually be either the one that has the least adverse impact, or the one that provides maximum benefits.

Areas of development are identified as such if they are subdivided into streets, blocks, and lots. Confirmation can be made by field survey, or examination of land use inventory maps or aerial photographs. Developed areas should include recorded subdivisions, even if the streets are unopened

or if there are large numbers of vacant lots.

Changes in Traffic on Local Interchange Streets

Expressways in developed areas will cause changes in the volumes of automobile and truck traffic on many of the local interchange streets. This effect should be evaluated by comparing the estimated changes in traffic with the type of property development abutting the streets.

An interchange between an expressway and a local street will cause an increase in traffic volumes on that local street. An expressway alignment closely parallel to a major street may cause a decrease in traffic volume on that street by removing through traffic. A significant decrease in traffic will occur if a major street is blocked by an expressway; however, this should occur only rarely, if ever. The following discussion focuses on evaluating the probable results of traffic increases on local interchange streets since traffic increases will occur in almost all cases. Evaluation of the other effects should be approached in a similar manner.

Identifying Study Areas. Study areas should be located by examining the layouts of the proposed alignments on the street base maps. Only those streets that would be affected differently by the alternate alignments should be designated as study areas. Study areas for evaluating the effects of traffic increases should include only the property parcels abutting the street that would interchange with the alignments. The name of each street should be noted on the tabulation form in order to assist in local understanding of the results of the study.

Determining the distance that the study areas should extend along the streets that would interchange with the alignments may present some

difficulties. In certain instances, this distance will be obvious. For instance, if the interchange will serve a significant generator of traffic, such as an industry or a group of industries generating large employee and truck traffic volumes, the study area should extend as far as that generator.

The extent of study areas frequently will not be obvious. The best approach would be to use the combined judgment of a traffic engineer and a planner to estimate the area within which the probable traffic increase would have an impact on abutting development. This approach should be applicable in most of the instances where the limits of study areas are not obvious.

It may occasionally be necessary to use arbitrary, yet consistent, criteria in delineating the extent of study areas. There are a number of criteria that may be used. For example, study areas may be extended a certain number of blocks or cross-streets from the expressway right-of-way. In other cases, a certain distance in feet from the expressway right-of-way lines may be used. Another method may be to limit the extent of study areas to the distance to the next major cross street. In any of these approaches, the distances should be kept small -- the first major cross street, one-fourth mile, or perhaps four blocks. Someone such as the person making the study must exercise the necessary judgment.

Determining Changes in Traffic Volumes. For each study area the expected increases in traffic volumes that will be caused by each interchange should be noted on the tabulation form. Probable increases in truck traffic should also be tabulated. This information may be obtained from a number of different sources.

The information on each proposed alignment supplied by the highway engineers should include estimates of the traffic volumes that will occur on the interchange ramps soon after construction is completed or at a future design year. How that traffic would be distributed onto the interchanging streets, as to amount by direction of travel, may be included. If either the amounts of the future traffic volumes or their distribution onto the interchanging streets is not directly available, then estimates should be made, considering ramp arrangements, the local street system and existing distribution of traffic volumes, and present and future land use patterns.

Probable truck volumes, if supplied, will usually be indicated as a percentage of total traffic volumes. If not supplied, the future truck volumes should be calculated to be at least the same percentage of future traffic as at present. However, the presence of large numbers of industrial development sites in the vicinity of an interchange may increase daily truck traffic to a greater degree than other traffic will increase.

The information supplied by the highway engineers may include present traffic volumes on the interchanging streets. If the interchanging street is on the State or Federal highway system, present traffic volumes may be available from the State Highway agency. Usually, however, it will be necessary to obtain present traffic volumes from the traffic counts made by the local municipal agency responsible for street traffic control. This information may be already available. If it is not, or if it is outdated, then counts should either be requested or made as part of this study.

The increase in traffic volume in each study area should be determined by subtracting the existing traffic volume from the estimated future traffic volume. This should be tabulated in numbers of vehicles per day. However, for streets presently having large traffic volumes, noting the percentage increase may be more helpful to an evaluation of effects.

The estimated future traffic volume on the interchanging streets should be compared with the capacities of those streets (as indicated by traffic engineering standards) to determine if those streets will be overloaded with traffic, resulting in congestion. If so, that should also be noted on the tabulation forms.

Determining Effects on Abutting Development. Only those uses of property in each study area that would have an obviously beneficial or harmful impact from an increase in traffic should be tabulated. Some property uses that would probably be affected in most cases are discussed below.

Residences should be tabulated in terms of numbers of dwelling units, which can be equated to families for study purposes. Dwellings, or families, will be harmed by increases in traffic, particularly truck traffic. The degree of impact will probably be in direct proportion to the degree of traffic increase. Impact will also depend upon the setback of the residences from the street -- that is, the greater the setback, the less harmful should be the impact. The residential setback should be noted in terms of average distance for each study area.

Public facilities such as schools will usually be affected in the same manner as residences. However, the conclusions in any specific

instance should be confirmed by the public agency or officials in charge of the facilities. Plans for the future relocation or abandonment of facilities should be recognized.

Retail businesses fronting on the streets being analyzed can be classified as primarily highway oriented or primarily residentially oriented. The number of each type of business should be tabulated.

Highway oriented businesses include automobile service stations, commercial lodging facilities, drive-in activities, automobile sales and service businesses, and miscellaneous eating and drinking establishments. These businesses usually function independently of each other and occur either singly in isolated locations or in loose association in strips along traffic arteries. These businesses should be benefited by traffic increases up to the point of congestion.

Residentially oriented businesses include those retail activities providing a service primarily to surrounding residential areas. These usually occur in nucleated centers such as shopping districts and centers at intervals along traffic arteries, but may also occur in isolated locations. Slight increases in traffic may be unimportant or even beneficial to these businesses. However, traffic increases that inconvenience their basic customers (surrounding residents) would be harmful.

The numbers of other property uses such as industries, warehouses and transportation terminals should be tabulated if the effects of changes in traffic on abutting streets will obviously be harmful or beneficial. This will depend upon the nature of the use or activity, its relationship to traffic facilities, and its importance to the local area.

On streets that would be congested with traffic as a result of interchanging with an expressway, all abutting property uses would be harmed. However, this may be less serious for the highway oriented businesses than for other uses.

Field inspection of each study area will usually be required in order to obtain information on property usage as of the time of the study. This will require the use of large maps showing individual parcels of property. Much of the work can be reduced, however, by utilizing whatever existing land use information for each area is available in the local planning offices. Local urban renewal or housing agencies may have land use information for certain areas.

Bisecting of Service Areas

Within the developed portion of an urban area there are many activities that provide services to surrounding areas. These require access by local streets. Many of these activities are classified as public in nature, such as schools, libraries and fire stations. Others may be private or semi-public, such as shopping centers or churches.

Expressway alignments within developed areas will invariably bisect service areas, primarily because the boundaries of the many different service areas are not coterminous. If service area boundaries were coterminous, it might be possible to avoid bisecting them.

The bisecting of a service area by an expressway means the separation, or isolation, of a portion of the users of that service from the physical facilities that comprise the service center. The results may be inconvenience to local citizens, public expenditures for corrective measures, and loss of sales to established businesses.

The analysis of this effect may be questioned as being significant in the selection of expressway alignments, since traffic and pedestrian cross-overs can be used to provide for continuity of existing travel routes. However, unless every travel route is maintained intact, some circuitousness in local travel will result. Also, the expressway may present a psychological barrier.

As an example of the bisecting of service areas by expressway alignments, the probable effects of alignments that would be located within school service areas and retail trade areas are discussed. The effects on school service areas may be measured in terms of the number of students that would be separated from the schools. The effects on retail trade areas may be measured in terms of impact upon the related retail centers -- amount of floor area or annual sales potentially affected. Although similar in concept and procedure, the analyses of these two effects will be discussed separately because two different operations are actually involved.

School Service Areas. The best source of information concerning the separation of students from schools by proposed expressway alignments should be the local school board. The name of each school affected should be tabulated as an aid to local understanding.

In many instances, the number of students that would be separated by each alignment can be supplied by local school officials if they are furnished the locations of the alignments on the street base maps. This approach should be taken when possible in order to save time and to obtain the participation of the school board.

If school officials are unwilling or unable to make a determination of the number of students that would be isolated, then a number of

approaches may be taken. For instance, the school board may have dot maps showing the locations of students in each school district. In that case, the proposed alignments can be located on the dot maps or on transparent overlays at the same scale, and the number of students separated from each school counted directly from these maps.

In some localities, only the location of school district boundaries and the number of students attending each school may be available. The first step then would be to determine the portions of the school districts that would be isolated by each alignment. This can be done by comparing the location of each alignment with a delineation of the school districts in the vicinity of the alignment. Proposed alignments and school districts could be plotted on a series of street base maps, but the use of a combination of transparent overlays should reduce the work required.

The number of students that would be separated from each school can be estimated by multiplying the number of families in the isolated portion of the school district by the average number of pupils per family for either that area, for the district, or for the locality as a whole -- depending on the source and accuracy of data. Numbers of families, or dwellings, may be obtained from existing land use inventories, if available, or from direct field surveys. If field counts of dwellings are necessary, property maps for the isolated areas would be required.

If school districts are not delineated or are not used, and if the number of students that would be isolated by each alignment is not available from the school board, the following approach should be used. It is based on the assumption that most students tend to be assigned to, or attend, the schools most convenient to their homes.

The first step is to locate on the street base maps showing the alternate alignments the schools along each alignment that would appear to have their service areas bisected. Then the number of students attending each such school should be obtained from the school board. The location of the boundary between adjacent schools should be estimated on the bases of the relative size of each school, then modified by noting existing routes of travel and non-residential land use areas. The portion of each school service area so delineated which would be isolated by each alignment may then be determined by comparing the service area boundaries with the proposed alignment location. The students in each isolated area may be determined by the use of student dot maps, if available, or by relating numbers of families to numbers of students, as outlined previously.

In determining the number of students that would be isolated by the proposed alignments, plans for future changes in school facilities should be considered. This information should usually be available from the school board, but may in some instances be available from the local planning agency.

Retail Trade Areas. Outside the central business district, and for the purposes of this study, the commercial services for the residents of an urban area may be described as consisting of retail centers serving surrounding trade areas. The term retail center is used to designate clusters or groupings of existing businesses offering goods and services to nearby families. These centers are sometimes identified as shopping centers or shopping districts. Occasionally, a large individual business establishment may also be included in this definition in a specific

locality -- for instance, a supermarket, or a variety or department store. The residential area containing the families that patronize the retail center is referred to as the trade area.

The bisecting of a trade area by an expressway alignment would make the access between the retail center and the area that would be separated from that center more difficult. This means only that some part of the annual sales to the families in the isolated area would be transferred to a competing center that would be relatively more convenient to that area after the expressway was constructed. Thus, a study of the bisecting of trade areas can indicate only the degree of potential disruption of existing trading patterns, and not an actual loss or gain to any individual retail center.

The first step is to locate on the street base maps depicting the proposed alignments the retail centers which have trade areas that would probably be bisected by the alignments. The retail centers that should be located on these maps are those which have a trade area radius greater than the distance to the proposed alignment.

The radius of each trade area is a function of the size and relative influence of its retail center. The most readily usable indicators of size are the gross leasable floor area and the type of the largest, or major, tenant in each center. Some relationships between size and trade area radii that may be useful are shown in Table 1. The information in Table 1 is general in nature, and should be used only for preliminary study estimates. It is based on national averages, and may be revised to more accurately match local conditions through the use of census information and Sales Management's annual Survey of Buying Power (11).

Table 1. Factors Useful in Estimating Retail Trade Areas (12).

Factor	Type of Retail Center		
	Neighborhood	Community	Regional
Major Tenant	Supermarket or Drug Store	Variety or Jr. Dept. Store	One or Two Full-line Department Stores
Average G.L.A.* (Sq. Ft.)	50,000	150,000	400,000
Range in G.L.A.* (Sq. Ft.)	30,000 100,000	100,000 to 300,000	300,000 to over 1,000,000
Average Site Area (Acres)	5	15	40
Minimum Support (Families)	2,000 to 10,000	10,000 to 40,000	40,000 to over 100,000
Radius of Drawing Power (Miles)	1-1/2	3 to 4	7 to 8
Total Annual Sales ($)	2,500,000 to 8,000,000	8,000,000 to 20,000,000	20,000,000 to over 50,000,000

*Gross leasable floor area.

The trade area for each center should be delineated to include families that provide the basic trade for the center. This may be done by working outward from the center, counting families from land use surveys or other sources of data. These families should be within concentric rings of equal travel time from the center. The trade areas may be warped by a number of factors. These include differences in access routes, barriers such as breaks in the street pattern, areas of non-residential development, and competing centers.

The next step should be to determine the proportions of the trade areas that would be isolated by the proposed alignments. These proportions may be tabulated in a number of ways. For purposes of selecting the best alignment, it should be adequate to translate each proportion into square feet of floor area at the related retail center. If local publicity is desired, the results could be expressed in terms of annual sales dollars by translating floor area into sales. However, that would require more detailed investigation than could probably be justified and is beyond the scope of this thesis.

Regardless of how expressed, the results should be adjusted in a generalized manner to reflect the income level of the families in the isolated area relative to the average income of the families in the total trade area. The best indicator of relative income might be the ratio of the value of the houses in the isolated area to the value of the houses in the other portions of the trade area.

Other methods and approaches may be used to evaluate the effects of proposed expressway alignments upon retail trade areas. However, those methods appear to be more complicated with no more valid results, or

easier but with even less valid results.

Perhaps the quickest and easiest method of evaluating the impact of the alignments on any bisected trade areas would be to obtain the opinions of the owners of the related centers, or the major tenants, or representatives of the merchants associations, or realtors familiar with the centers. The only maps required would be the layouts of the alternate alignments on the street base maps. The results of this approach would be opinions only and not facts, and could be extremely biased. The only advantages of this method are that it would be quick and that it would require involvement, and therefore appreciation of the problem, by the individual businessmen.

Creation of Property Remnants Difficult to Use

In acquiring the right-of-way for an expressway through a developed portion of an urban area, remnants of existing property parcels may be left contiguous to and outside of the right-of-way lines. These remnants may be created either by the acquisition of only a portion of existing parcels (leaving the remainder in the present ownership) or by the acquisition of whole parcels and then including only a portion of those parcels in the rights-of-way. In the latter case, the most basic question is whether the remnants should be made available for private development or whether they should be retained in public ownership. In either case, the future use of these remnants may create many types of local land use problems. Such problems may be anticipated by noting the shape and size of the remnants that would be created by each proposed alignment. The fact that the remnants would be contiguous to the expressway will also have a bearing in the evaluation of future use possibilities and problems.

The first step is to examine the layouts of the alternate alignment proposals on the street base maps for locations where small or odd shaped remnants will likely occur. This condition should be indicated by alignments that do not parallel the existing street pattern, or locations in areas having an irregular street pattern. Alignments that would parallel existing streets may also create remnants if the right-of-way widths do not coincide with a multiple of the dimensions of the property parcels that would be acquired.

In order to more accurately determine the characteristics of the property remnants that would be created by each alignment, the next step should be to plot the proposed or estimated right-of-way lines on property maps of each problem area previously identified. The maps used to evaluate the probable displacement effects of the alignment proposals, as described in the previous chapter, may frequently be useful in the evaluation of the remnants that would be created.

The number of remnants and their total area should be tabulated for each alignment. These remnants should be those that would have narrower dimensions or smaller areas than the other land parcels in the vicinity or than the minimum dimensions required by the zoning ordinance for that location or zoning district. If the general area is residential in nature, the future use that can be made of small or odd shaped remnants adjacent to the expressway right-of-way by private developers may conflict with the residential character of the area. A solution may be to retain such remnants in public ownership as open space. Other use possibilities may be for publicly assisted housing, for public service facilities, or resale to other adjoining property owners.

Effects on Areas Subject to Development

Urban communities have a vital interest in the location and character of future development. This may occur in areas that are presently unsubdivided or undeveloped, or in presently developed areas that contain urban renewal projects. Some future development may occur by means of private redevelopment; however, that will be smaller in amount and is difficult to anticipate.

The term "subject to development" is used in the following discussion to include primarily unsubdivided, undeveloped, or urban renewal areas. In most cases, the influence of proposed expressway alignments on adjacent areas which would be classified as being subject to development can be anticipated and used in the selection of the most desirable alignment from the local point of view.

Identifying Study Areas

Unsubdivided and undeveloped areas will occur principally in suburban locations. In any portion of the urban area, however, these areas may be identified, through an examination of the street base map, as gaps or open spaces in the street pattern. Confirmation should be obtained from field surveys, existing land use maps or aerial photographs.

These areas should be contiguous to the alignments, although a small amount of intervening development, such as one street with development along both sides, should be ignored in studying this effect. These study areas should extend outward from the alignments only as far as the characteristics of the area indicating use suitability remain the same, or until boundaries such as existing development, rivers, railroads,

abrupt changes in topography or large public areas are encountered.

The locations and boundaries of existing urban renewal project areas should be obtained from the local urban renewal agency. This may frequently be the local housing authority. Information on areas planned for future renewal may be obtained from either the renewal agency or the local planning office. Of course, only the area within the boundaries of the renewal areas should be evaluated for expressway impact on undeveloped areas.

Tabulating Characteristics of Study Areas

There are many characteristics of land areas that indicate future use potential. These characteristics should be determined and compared with probable impact from adjacent expressways. Some of the most important of these characteristics and some of the obvious impacts from expressways are discussed below. In addition, the size in acres of each area should be tabulated.

The topography of each study area should be examined as a possible limitation on development. Generally, an area with extremely rugged topography will be unsuitable for industrial and commercial development, and may be costly to develop for residential purposes. The average slope of industrial sites should usually be less than five per cent. Exceptions should be readily identifiable.

Topography should also indicate any potential difficulties with drainage or sewage service. Areas subject to flooding should be noted as being unsuitable for development. The local public engineer should be contacted for topographic data and maps, and information, opinions and plans on drainage and sewage service for each study area.

Water supply systems and other utilities should be checked for availability to each study area. Future plans for improvements or extensions of utility service should be considered. Information on utilities should be obtained from the responsible administrative agency or the local city or county engineer.

Accessibility to other elements of the transportation system is another factor determining development potential. Access to railroad lines and proximity to airports should indicate either suitability for industrial development or unsuitability for residential development. This information should usually be identifiable from the street base maps. Other sources of information are existing land use maps, aerial photographs, and field surveys.

Surrounding development may influence or indicate the use suitability of study areas. If adjacent areas are residentially developed, and the study areas would be desirable for industrial development after expressway construction, local land use conflicts may result. The presence of buffers such as topographic breaks, rivers, and institutional uses between the conflicting use areas should reduce the problems.

Most of the required data can be obtained from local public agencies, without field surveys, after study areas have been delineated on study maps. The principal property use classifications required for this tabulation are residential and industrial. Occasionally, locations for regional shopping centers may be obvious, but these would seldom provide a basis for selecting one proposed alignment as compared to another.

Tabulating Effects of Expressways

There are a number of effects that an expressway alignment may

have on an area. Accessibility may be decreased by the blocking of existing streets and by failure to provide cross-overs and interchanges for future traffic. An increase in vehicular accessibility will be indicated for areas abutting streets that would interchange with the expressway. Property that would abut frontage roads will also have an increase in accessibility.

If a study area having a non-residential development potential would have future access only through an area of existing residential development or through an undeveloped area suitable only for residential development after expressway construction, the alignment should be considered undesirable in that location.

A study area can be increased or decreased in development potential by the configuration of the space remaining between an alignment and the other boundaries of that area. The area must have adequate minimum dimensions for development. Development features and facilities and topographic features may function as boundaries should usually not be less than 200 feet, although this actually depends upon the indicated future use of the area. If the distance to the other boundaries cannot be at least the minimum necessary to accommodate intervening building sites and a service roadway, the alignment should be contiguous to such boundaries.

Adjacent areas otherwise increased in use potential by expressways may be difficult or even impossible to serve by public facilities or utilities. This may be an ultimate limitation on development, or at least indicate extra costs or problems for local public bodies. Limitation on development, or at least indicate extra costs or problems for

local public bodies. Limitations may be due to lack of financial or administrative ability (as for additional schools) or to characteristics of the study area (such as being located in a different watershed from available sewers).

Other Approaches

This chapter outlined methods for evaluating the physical effects of alternate expressway alignment proposals that would occur outside the right-of-way lines. Effects thought to have the greatest local importance were discussed. There are, of course, many other factors that could be selected for tabulation, as well as other conceptual approaches.

In the approach presented, some probable land use and development impacts were used to illustrate a method for local evaluation of alternate expressway alignment proposals. Other approaches have usually focused on impact on area economy and land values. However, those approaches are usually too restricted in concept to be useful in the selection of the most desirable alignment from among a number of alternatives.

CHAPTER IV

FINAL EVALUATION OF ALL FACTORS

The previous chapters discussed examples of nonengineering factors that should be considered in deciding upon the relative desirability of alternate expressway alignment proposals from the point of view of the urban community. These factors were organized into two groups for discussion purposes.

The first group of factors was based on the displacement effects that would be caused by right-of-way acquisition and clearance. These included the displacement of families that would present relocation difficulties and the displacement of public facilities. Also discussed was the decrease in public revenue that could be caused by the conversion of tax producing private property to non-taxable right-of-way.

The second group of factors was based on the probable impact of the completed expressway alignments on adjacent areas, both areas that are presently developed and areas that are subject to future development. These factors include the impact on property uses abutting local streets that would have increases in traffic volumes as a result of interchanging with one of the alignments, the bisecting of school service areas and retail trade areas, the creation of property remnants that would present future use problems, and the probable impact of each alignment upon the use potential of adjacent areas which are subject to future development.

Illustrative tabulation forms based upon the above factors have been prepared and are included in the Appendix. These forms were

designed for tabulating and summarizing the results of the analysis of each alignment, and are actually work forms. These forms should be completed through the use of work maps, office studies and interviews, and field surveys.

An illustrative evaluation form designed to facilitate the comparative evaluation of all effects of the alternate alignments is also included in the Appendix. It should be completed using the data compiled on the tabulation forms. The evaluation form is arranged so as to present together in the same grouping all the potential effects upon the same type of land use, or land area having the same general development characteristics. These groupings include residences (or families) and residential areas, public facilities and service areas, and industrial and business uses and areas. A number of miscellaneous effects are also included, such as the condition of the structures that would be removed, and types of zoning nonconforming uses that would be eliminated.

After completing the evaluation form, the most desirable alignment from the local point of view should be selected. The final selection should not be the sole responsibility of the person making the study -- his primary task should be to gather, analyze and present the facts that should be used as a basis for a final decision by responsible local officials.

In arriving at a final selection between alternate alignment proposals, the estimated cost of acquiring the land for the right-of-way and for the construction of each alignment should be considered. The cost estimates should be furnished by the highway engineers. If one of the

more costly alignments is the most desirable, then efforts should be concentrated on convincing the State highway agency to (1) agree to the extra expense, and (2) to support the locality in a request to the Federal Bureau of Public Roads to agree to that alignment if Federal financial participation is involved.

If the cheapest route is obviously the least desirable or most objectionable, then efforts should focus on getting all governmental agencies to agree to avoid that alignment.

The final selection of an expressway alignment should be a joint responsibility of every governmental unit involved, including the local area governments, even if local financing is not required. Every factor must be considered, including geometrics, engineering and construction feasibility, costs, and local impact. Compromises will be inevitable. However, at the least, alignments which would be extremely undesirable to the locality should be avoided, even if more costly than other possible alignments.

The factors, evaluation procedures, and illustrative forms presented in this thesis should assist in the local evaluation of alternate expressway alignments and contribute to the objective selection of the most desirable alignment from all points of view. Recognition of non-engineering factors, such as those presented here, in the determination of expressway locations, should further local acceptance of expressways and the success of urban area expressway programs.

A P P E N D I C E S

APPENDIX A

Illustrative Tabulation Form for Displacement Effects by Rights-of-Way

Alignment _____
Block _____

Factors	Measure	(Lot)		(Block)		Total
Families	No.					
White	No.					
(0-$20) (0-$3000) *	No.					
($20-$60) ($3000-$9000) *	No.					
(Over $60) (Over $9000) *	No.					
Non-White	No.					
(0-$20) (0-$3000) *	No.					
($20-$60) ($3000-$9000) *	No.					
(Over $60) (Over $9000) *	No.					
Public Facilities	No.					
Schools	No.					
Replacement Cost	$					
Parks	Acres					
Replacement Cost	$					
Others (Libraries, Fire Stations, Etc.)	No.					
Replacement Cost	$					
Industries	No.					
Employees	No.					
Floor Area	Sq. Ft.					
Value	$					
Retail Businesses	No.					
Employees	No.					
Floor Area	Sq. Ft.					
Value	$					
Other Business, Activities, Institutions, Etc. (by specific type)	No.					
Employees	No.					
Floor Area	Sq. Ft.					
Value	$					

APPENDIX A (Continued)

Factors	Measure	(Lot)		(Block)	Total
Annual Public Income Lost	$				
Property Taxes	$				
Licenses	$				
Others	$				
Structures Displaced	No.				
Standard	No.				
Deteriorating	No.				
Dilapidated	No.				
Zoning Nonconforming Uses Eliminated (list specific activity or use)	No.				

* Rental Classification -- first set of numbers indicates monthly rent paid; second set of numbers indicates value of housing owned or occupied.

APPENDIX B

Illustrative Tabulation Form for
Effects of Expressways on Adjacent Developed Areas

Alignment _____

Factors	Measure	Study Areas			Total or Comments
Changes in Traffic on Local Streets					
Abutting Uses	No.				
Families	No.				
Schools	No.				
Other Public Facilities (by specific type)	No.				
Industries	No.				
Retail Businesses	No.				
Highway Oriented	No.				
Residential Oriented	No.				
Other Businesses, Activities, Institutions, Etc. (by specific type)	No.				
Changes in Traffic					
Increase	%				
Decrease	%				
Congestion	(Yes)				
Truck Traffic					
Increase	%				
Decrease	%				
Average Setback	Feet				
Bisection of Public Service Areas, Trade Areas and Public Parks					
Bisection of Public Service Areas					
School Service Area Isolated	Students				
Others - Proportion of Area Isolated	Families, Etc.				

APPENDIX B (Continued)

Factors	Measure	Study Areas			Total or Comments
Bisection of Retail Trade Areas (Measure of bisection effects in terms of portion of floor area or annual retail sales)	$ or Sq. Ft.				
Bisection of Public Parks					
Area Isolated	Acres				
Correction Cost	$				
Creation of Property Remnants Difficult to Use					
Remnants	No.				
Area	Acres				
Nature of Surrounding Area					
Residentially Developed					
Subject to Development					

APPENDIX C

Illustrative Tabulation Form for Effects of Expressways on Adjacent Areas Subject to Development

Alignment _____

Factor	Measure	Study Area				Total or Comments
Size	Acres					
Development Potential						
Topography						
Flat						
Slightly Rolling						
Moderately Rolling						
Rugged						
Drainage						
Well Drained						
Subject to Flooding						
Servicable by:						
Schools						
Other Public Services						
Sanitary Sewage						
Water						
Other Utilities						
Accessible to:						
Rail						
Navigable Water						
Major Street						
Vicinity Development						
Effects of Expressway						
Accessibility						
Improved						
Worsened						
Through Residential Areas						
Configuration of Resulting Area						
Developable						
Less Developable						
Demands Upon Local Public Services and Finances	+or -					
Schools	+or -					
Utilities	+or -					
Use Suitability (type)						

APPENDIX D

Illustrative Evaluation Form for All Factors

Factors	Measure	Alignment			Alignment Selection
Effects on Residential Areas					
Families Displaced	Families				
White	Families				
Insufficient Income (0-$20) (0-$3000) *	Families				
Eligible for Public Housing ($20-$60) ($3000-$9000) *	Families				
Self Sufficient (Over $60) (Over $9000) *	Families				
Non-White	Families				
Insufficient Income (0-$20) (0-$3000) *	Families				
Eligible for Public Housing ($20-$60) ($3000-$9000) *	Families				
Self Sufficient (Over $60) (Over $9000) *	Families				
Families Along Street With Traffic Changes	Families				
Benefitted	Families				
Harmed	Families				
Adjacent Areas Suitable for Future Development	Acres				
Increase in Potential	Acres				
Decrease in Potential	Acres				
Effects on Public Facilities					
Schools	No.				
Displaced	No.				
Replacement Cost	$				
Along Streets with Traffic Changes	No.				
Benefitted	No.				
Harmed	No.				
Service Area Isolated	No.				
Public Parks	No.				
Area Occupied	Acres				
Area Isolated	Acres				
Replacement or Correction Cost	$				

APPENDIX D (Continued)

Factors	Measure	Alignment			Alignment Selection
Other Public Facilities (by specific type)	No.				
Displaced	No.				
Replacement Cost	$				
Along Streets with Traffic Changes	No.				
Benefitted	No.				
Harmed	No.				
Service Area Isolated	Families				
Demands for Future Services	+or -				
Effects on Industrial Development					
Industries Displaced	No.				
Employees	No.				
Floor Area	Sq. Ft.				
Value	$				
Industries Along Streets with Traffic Changes	No.				
Benefitted	No.				
Harmed	No.				
Adjacent Areas Suitable for Future Development	Acres				
Increase in Potential	Acres				
Decrease in Potential	Acres				
Effects on Retail Businesses					
Businesses Displaced	No.				
Employees	No.				
Floor Area	Sq. Ft.				
Value	$				
Businesses Along Streets with Traffic Changes	No.				
Benefitted	No.				
Harmed	No.				
Measure of Trade Area Bisection (Annual sales or portion of floor area affected)	$ or Sq. Ft.				
Adjacent Sites Suitable for Future Regional Centers	No.				

APPENDIX D (Continued)

Factors	Measure	Alignment			Alignment Selection
Effects on Other Businesses, Activities and Institutions (by specific type)	No.	____	____	____	____
Displaced	No.	____	____	____	____
Employees	No.	____	____	____	____
Floor Area	Sq. Ft.	____	____	____	____
Value	$	____	____	____	____
Along Street with Traffic Changes	No.	____	____	____	____
Benefitted	No.	____	____	____	____
Harmed	No.	____	____	____	____
Adjacent Sites Suitable for Future Development	No.	____	____	____	____
Annual Public Income Reduction	$	____	____	____	____
Structures Displaced	No.	____	____	____	____
Standard	No.	____	____	____	____
Deteriorating	No.	____	____	____	____
Dilapidated	No.	____	____	____	____
Zoning Nonconforming Uses Eliminated (by specific type)	No.	____	____	____	____
Creation of Land Parcels Difficult to Use	No.	____	____	____	____
Total Area	Acres	____	____	____	____
Location in Residential Areas	Acres	____	____	____	____
Location in Areas Subject to Development	Acres	____	____	____	____
Construction Cost of Alignments	$	____	____	____	____

* Rental Classifications -- first set of numbers indicates monthly rent paid; second set of numbers indicates value of housing owned or occupied.

B I B L I O G R A P H Y

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